

Claims

What is claimed is:

1. In a multicarrier modulation system including a first transceiver in communication with a second transceiver using a transmission signal having a plurality of carrier signals for modulating an input bit stream, each carrier signal having a phase characteristic associated with the input bit stream, a method for scrambling the phase characteristics of the carrier signals comprising:
 - associating each carrier signal with a value determined independently of any input bit value carried by that carrier signal;
 - computing a phase shift for each carrier signal based on the value associated with that carrier signal; and
 - combining the phase shift computed for each carrier signal with the phase characteristic of that carrier signal so as to substantially scramble the phase characteristics of the plurality of carrier signals.
2. The method of claim 1 further comprising modulating bits of the input bit stream onto the carrier signals having the substantially scrambled phase characteristics to produce a transmission signal with a reduced peak-to-average power ratio (PAR).
3. The method of claim 1 further comprising independently deriving the value associated with each carrier signal at each transceiver.

- 1 4. The method of claim 1 further comprising transmitting the value associated with each carrier
2 signal from one transceiver to the other transceiver.
- 1 5. The method of claim 1 further comprising maintaining synchronization between the
2 transceivers using the value associated with each carrier signal.
- 1 6. The method of claim 1 wherein the value varies with each carrier signal.
- 1 7. The method of claim 1 wherein the value varies with each DMT symbol.
- 1 8. The method of claim 1 wherein the value is derived from a predetermined parameter.
- 9 9. The method of claim 8 wherein the predefined parameter is a carrier number.
- 10 10. The method of claim 8 wherein the predefined parameter is a symbol count.
- 11 11. The method of claim 8 wherein the predefined parameter is a hyperframe count.
- 12 12. The method of claim 8 wherein the predefined parameter is a superframe count.
- 13 13. The method of claim 1 further comprising scrambling the bits of the input bit stream.
- 1 14. The method of claim 1 further comprising transmitting a predetermined transmission signal
2 when the amplitude of the transmission signal exceeds a certain level.
- 1 15. The method of claim 14 wherein the predetermined transmission signal comprises a
2 predetermined pattern of bits.

- 1 16. The method of claim 14 wherein the predetermined transmission signal comprises a pilot
2 tone.
- 1 17. The method of claim 16 wherein the pilot tone is used to maintain timing synchronization
2 between the first transceiver and the second transceiver.
- 1 18. The method of claim 15 wherein each bit value in the predetermined pattern of bits is a zero
2 value.
- 1 19. The method of claim 15 wherein the predetermined pattern of bits is a pseudo-random
2 sequence pattern.
- 1 20. In a multicarrier modulation system including a first transceiver in communication with a
2 second transceiver using a transmission signal having a plurality of carrier signals for
3 modulating an input bit stream, each carrier signal having a phase characteristic with the
4 input bit stream, a method for scrambling the phase characteristics of the carrier signals
5 comprising:
6 associating each carrier signal with a value determined independently of any input bit
7 value carried by that carrier signal;
8 computing a phase shift for each carrier signal based on the value associated with that
9 carrier signal; and
10 demodulating the transmission signal using the phase shift computed for each carrier
11 signal.

- 1 21. The method of claim 20 further comprising independently deriving the value associated with
2 each carrier signal at each transceiver.
- 1 22. The method of claim 20 further comprising transmitting the value associated with each
2 carrier signal from one transceiver to the other transceiver.
- 1 23. The method of claim 20 further comprising maintaining synchronization between the
2 transceivers using the value associated with each carrier signal.
- 1 24. The method of claim 20 wherein the value varies with each carrier signal.
- 1 25. The method of claim 20 wherein the value varies with each DMT symbol.
- 1 26. The method of claim 20 wherein the value is derived from a predetermined parameter.
- 1 27. The method of claim 26 wherein the predefined parameter is a carrier number.
- 1 28. The method of claim 26 wherein the predefined parameter is a symbol count.
- 1 29. The method of claim 26 wherein the predefined parameter is a hyperframe count.
- 1 30. The method of claim 26 wherein the predefined parameter is a superframe count.
- 1 31. The method of claim 20 further comprising receiving a predetermined transmission when the
2 amplitude of the transmission signal exceeds a certain level.
- 1 32. The method of claim 31 wherein the predetermined transmission signal comprises a
2 predetermined pattern of bits.

- 1 33. The method of claim 31 wherein the predetermined transmission signal comprises a pilot
2 tone.
- 1 34. The method of claim 33 wherein the pilot tone is used to maintain timing synchronization
2 between the first transceiver and the second transceiver.
- 1 35. The method of claim 32 wherein each bit value in the predetermined pattern of bits is a zero
2 value.
- 1 36. The method of claim 32 wherein the predetermined pattern of bits is a pseudo-random
2 sequence pattern.
- 3 37. A transceiver for communicating over a communication channel using a transmission signal
4 having a plurality of carrier signals, each carrier signal having a phase characteristic, the
5 transceiver comprising:
6 a phase scrambler computing a phase shift for each carrier signal based on a value
7 associated with that carrier signal and combining the phase shift computed for each carrier
signal with the phase characteristic of that carrier signal so as to substantially scramble the
phase characteristics of the plurality of carrier signals.
- 1 38. The transceiver of claim 37 further comprising a modulator in communication with the phase
2 scrambler, the modulator modulating bits of an input signal onto the carrier signals having
3 the substantially scrambled phase characteristics to produce a transmission signal with a
4 reduced PAR.

